

REMARKS

This is a full and timely response to the outstanding nonfinal Office Action mailed July 5, 2001. Reconsideration and allowance of the application and presently pending claims 1-10 and 14-25 are respectfully requested.

1. Present Status of Patent Application

Upon entry of the amendments in this response, claims 1-10 and 14-25 remain pending in the present application. More specifically, claim 2 is directly amended, and claims 18-25 are added. These amendments are specifically described hereinafter. It is believed that the foregoing amendments and additions add no new matter to the present application.

2. Response to Rejection of Claim 2 Under 35 U.S.C. §112

In the Office Action, claim 2 stands rejected under 35 U.S.C. §112 as lacking sufficient antecedent basis for the limitation cited in the claim. Applicants have amended the claim to read, "prior to the step of removing the **remaining layer of silicon oxynitride**." Applicants respectfully submit that the rejection has been overcome in light of the foregoing amendment.

3. Response to Rejection of Claims 1-6, 10 and 14 Under 35 U.S.C. §103

In the Office Action, claims 1-6, 10 and 14 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over *Lee* (U.S. Patent 5,620,913) in view of *Fu* (U.S. Patent 6,245,682). It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest, either implicitly or explicitly, all features and/or steps of the claim at issue. See, e.g., *In Re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988), and *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

a. Claim 1

Assuming that the references are properly combinable and qualify as prior art, applicants respectfully submit that claim 1 is allowable for at least the reason that the

proposed combination of *Lee* in view of *Fu* does not disclose, teach, or suggest the step of “removing the remaining layer of silicon oxynitride by etching in hot phosphoric acid **before subjecting the layer of silicon oxynitride to any temperature greater than about 400°C**” (*emphasis added*) as recited in claim 1. That is, one embodiment, among others, of the present invention, as recited in claim 1, necessitates that the silicon oxynitride not be exposed to a temperature greater than about 400°C in order to achieve a reasonable etch rate.

Applicants believe that the combination of *Lee* in view of *Fu* does not disclose, teach, or suggest the concept of not exposing the silicon oxynitride to a temperature of greater than 400°C. The Office Action that there is no recitation of such a limitation, but that it is inherently present because all of the steps are performed. Applicants respectfully submit that the silicon oxynitride may be etched even after exposure to a temperature above 400°C. However, the etch rate of silicon oxynitride exposed as such is “about .2nm per minute...at this etch rate, the amount of time required to remove silicon oxynitride layer 26 would cause serious etching of the exposed edge of the silicon nitride.” Application specification, page 7, lines 17-23. Applicants respectfully submit that it was not well known in the art that exposing silicon oxynitride to high temperatures hindered the etching process. Applicants respectfully submit that this may be why *Fu* recites the sidewall oxide deposition to protect the interpoly dielectric as “the key to this invention.” *Fu*, col. 5, lines 19-20. Therefore, Applicants respectfully assert that the combination of *Lee* in view of *Fu* does not disclose, teach or suggest the limitation as such, as recited in claim 1.

b. Claim 2-6

Because independent claim 1 is believed to be allowable over the prior art of record, dependent claims 2-6 (which depend either directly or indirectly from independent claim 1) are allowable as a matter of law for at least the reason that the dependent claims 2-6 contain all steps of independent claim 1. See, *e.g.*, *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988).

c. Claim 10

Assuming that the references are properly combinable and qualify as prior art, applicants respectfully submit that claim 10 is allowable for at least the reason that the proposed combination of *Lee* in view of *Fu* does not disclose, teach, or suggest the step of “etching the silicon oxynitride in a phosphoric acid etchant **without subjecting the layer of silicon oxynitride to any temperature greater than about 400°C between the steps of depositing and etching**” (*emphasis added*) as recited in claim 10. That is, one embodiment, among others, of the present invention, as recited in claim 10, necessitates that the silicon oxynitride not be exposed to a temperature greater than about 400°C in order to achieve a reasonable etch rate as outlined in the specification.

Applicants believe that the combination of *Lee* in view of *Fu* does not disclose, teach, or suggest the concept of not exposing the silicon oxynitride to a temperature of greater than 400°C. The Office Action that there is no recitation of such a limitation, but that it is inherently present because all of the steps are performed. Applicants respectfully submit that the silicon oxynitride may be etched even after exposure to a temperature above 400°C. However, the etch rate of silicon oxynitride exposed as such is “about .2nm per minute...at this etch rate, the amount of time required to remove silicon oxynitride layer 26 would cause serious etching of the exposed edge of the silicon nitride.” Application specification, page 7, lines 17-23. Applicants respectfully submit that it was not well known in the art that exposing silicon oxynitride to high temperatures hindered the etching process. Therefore, Applicants respectfully assert that the combination of *Lee* in view of *Fu* does not disclose, teach or suggest the limitation as such, as recited in claim 10.

d. Claim 14

Assuming that the references are properly combinable and qualify as prior art, Applicants respectfully submit that claim 14 is allowable for at least the reason that the proposed combination of *Lee* in view of *Fu* does not disclose, teach, or suggest the step of “etching the second layer in an etchant comprising hot phosphoric acid, the etching occurring **before the second layer is subjected to any temperature greater than about 400°C**” (*emphasis added*) as recited in claim 14. That is, one embodiment, among others,

of the present invention, as recited in claim 14, necessitates that the silicon oxynitride not be exposed to a temperature greater than about 400°C in order to achieve a reasonable etch rate as outlined in the specification.

Applicants believe that the combination of *Lee* in view of *Fu* does not disclose, teach, or suggest the concept of not exposing the silicon oxynitride to a temperature of greater than 400°C. Examiner notes in the Office Action that there is no recitation of such a limitation, but that it must be so because all of the other steps are performed. Applicants respectfully submit that the silicon oxynitride may be etched even after exposure to a temperature above 400°C. However, the etch rate of silicon oxynitride exposed as such is “about .2nm per minute...at this etch rate, the amount of time required to remove silicon oxynitride layer 26 would cause serious etching of the exposed edge of the silicon nitride.” Application specification, page 7, lines 17-23. Applicants respectfully submit that it was not well known in the art that exposing silicon oxynitride to high temperatures hindered the etching process. Therefore, Applicants respectfully assert that the combination of *Lee* in view of *Fu* does not disclose, teach or suggest the limitation as such, as recited in claim 14.

4. Response to Rejection of Claims 7-9 and 15-17 Under 35 U.S.C. §103

In the Office Action, claims 7-9 and 15-17 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over *Lee* (U.S. Patent 5,620,913) in view of *Fu* (U.S. Patent 6,245,682), as applied to claims 1 and 14, and further in view of *Cheung* (U.S. Patent 5,968,324). It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest, either implicitly or explicitly, all features and/or steps of the claim at issue. See, e.g., *In Re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988), and *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

a. Claim 7-9 and 15-17

Because independent claims 1 and 14 are believed to be allowable over the prior art of record, dependent claims 7-19 and 15-17 (which depend either directly or indirectly from independent claims 1 and 14, respectively) are allowable as a matter of law for at least the

reason that the dependent claims 7-9 and 15-17 contain all steps of independent claims 1 and 14, respectively. See, *e.g.*, *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988).

5. Response to Rejection of Claims 10 and 14 Under 35 U.S.C. §103

In the Office Action, claims 10 and 14 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over *Adkisson* (U.S. Patent 6,030,541). It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest, either implicitly or explicitly, all features and/or steps of the claim at issue. See, *e.g.*, *In Re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988), and *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

a. Claim 10

Applicants respectfully submit that claim 10 is allowable for at least the reason that *Adkisson* does not disclose, teach, or suggest the step of “etching the silicon oxynitride in a phosphoric acid etchant **without subjecting the layer of silicon oxynitride to any temperature greater than about 400°C between the steps of depositing and etching**” (*emphasis added*) as recited in claim 10, and this would not have been obvious to one of ordinary skill in the art. That is, one embodiment, among others, of the present invention, as recited in claim 10, necessitates that the silicon oxynitride not be exposed to a temperature greater than about 400°C in order to achieve a reasonable etch rate as outlined in the specification.

Applicants believe that *Adkisson* does not disclose, teach, or suggest the concept of not exposing the silicon oxynitride to a temperature of greater than 400°C. The Office Action that there is no recitation of such a limitation, but that it must be inherently present because all of the other steps are performed. Applicants respectfully submit that the Office Action means to say that the temperature limitation is well known in the art, since inherency of the limitation would have raised a novelty rejection rather than an obvious rejection. Applicants respectfully submit that the silicon oxynitride may be etched even after exposure to a temperature above 400°C. However, the etch rate of an exposed silicon oxynitride as

such is "about .2nm per minute...at this etch rate, the amount of time required to remove silicon oxynitride layer 26 would cause serious etching of the exposed edge of the silicon nitride." Application specification, page 7, lines 17-23. Applicants respectfully submit that it was not well known that exposing the silicon oxynitride to high temperatures would result in an extremely slow etch rate. Therefore, Applicants respectfully assert that *Adkisson* does not disclose, teach or suggest the limitation as such, as recited in claim 10.

b. Claim 14

Applicants respectfully submit that claim 14 is allowable for at least the reason that *Adkisson* does not disclose, teach, or suggest the step of "etching the second layer in an etchant comprising hot phosphoric acid, the etching occurring **before the second layer is subjected to any temperature greater than about 400°C**" (*emphasis added*) as recited in claim 14, and this step would not have been obvious to one of ordinary skill in the art. That is, one embodiment, among others, of the present invention, as recited in claim 14, necessitates that the silicon oxynitride not be exposed to a temperature greater than about 400°C in order to achieve a reasonable etch rate as outlined in the specification.

Applicants believe that *Adkisson* does not disclose, teach, or suggest the concept of not exposing the silicon oxynitride to a temperature of greater than 400°C. Examiner notes in the Office Action that there is no recitation of such a limitation, but that it must be inherently present because all of the other steps are performed. Applicants respectfully submit that the silicon oxynitride may be etched even after exposure to a temperature above 400°C. However, the etch rate of silicon oxynitride exposed as such is "about .2nm per minute...at this etch rate, the amount of time required to remove silicon oxynitride layer 26 would cause serious etching of the exposed edge of the silicon nitride." Application specification, page 7, lines 17-23. Applicants respectfully submit that it was not well known in the art that exposing silicon oxynitride to high temperatures hindered the etching process. Therefore, Applicants respectfully assert that *Adkisson* does not disclose, teach or suggest the limitation as such, as recited in claim 14.

Further, Applicants respectfully submit that claim 14 is allowable for at least the reason that *Adkisson* does not disclose, teach, or suggest the step of "etching the second layer in an

etchant comprising **hot phosphoric acid...** (*emphasis added*) as recited in claim 14. That is, one embodiment of the present invention, as recited in claim 14, uses **hot** phosphoric acid to etch the silicon oxynitride layer.

Applicants believe that *Adkisson* does not disclose, teach, or suggest the concept of using “hot” phosphoric acid to etch the silicon oxynitride layer. It appears from the specification of *Adkisson* that the etchant is merely phosphoric acid. Thus, Applicants respectfully assert that *Adkisson* does not teach, suggest or disclose the limitation as recited in claim 14.

6. Response to Rejection of Claims 15-17 Under 35 U.S.C. §103

In the Office Action, claims 15-17 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over *Adkisson* (U.S. Patent 6,030,541), as applied to claim 14, and in view of *Cheung* (U.S. Patent 5,968,324). It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest, either implicitly or explicitly, all features and/or steps of the claim at issue. See, e.g., *In Re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988), and *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

a. Claims 15-17

Because independent claim 14 is believed to be allowable over the prior art of record, dependent claims 15-17 (which depend either directly or indirectly from independent claim 14) are allowable as a matter of law for at least the reason that the dependent claims 15-17 contain all steps of independent claim 14. See, e.g., *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988).

7. Response to Rejection of Claim 1 Under 35 U.S.C. §103

In the Office Action, claim 1 stands rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over *Adkisson* (U.S. Patent 6,030,541) in view of *Lee* (U.S. Patent 5,620,913). It is well established at law that, for a proper rejection of a claim under 35

U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest, either implicitly or explicitly, all features and/or steps of the claim at issue. See, e.g., *In Re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988), and *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

a. Claim 1

Assuming that the references are properly combinable and qualify as prior art, applicants respectfully submit that claim 1 is allowable for at least the reason that the proposed combination of *Adkisson* in view of *Lee* does not disclose, teach, or suggest the step of “removing the remaining layer of silicon oxynitride by etching in hot phosphoric acid **before subjecting the layer of silicon oxynitride to any temperature greater than about 400°C**” (*emphasis added*) as recited in claim 1. That is, one embodiment of the present invention, as recited in claim 1, necessitates that the silicon oxynitride not be exposed to a temperature greater than about 400°C in order to achieve a reasonable etch rate.

Applicants believe that the combination of *Adkisson* in view of *Lee* does not disclose, teach, or suggest the concept of not exposing the silicon oxynitride to a temperature of greater than 400°C. Examiner notes in the Office Action that there is no recitation of such a limitation, but that it must inherently present because all of the other steps are performed. Applicants respectfully submit that the silicon oxynitride may be etched even after exposure to a temperature above 400°C. However, the etch rate of silicon oxynitride exposed as such is “about .2nm per minute...at this etch rate, the amount of time required to remove silicon oxynitride layer 26 would cause serious etching of the exposed edge of the silicon nitride.” Application specification, page 7, lines 17-23. Applicants respectfully submit that it was not well known in the art that exposing silicon oxynitride to high temperatures hindered the etching process. Therefore, Applicants respectfully assert that the combination of *Adkisson* in view of *Lee* does not disclose, teach or suggest the limitation as such, as recited in claim 1.

Further, Applicants respectfully submit that claim 1 is allowable for at least the reason that the proposed combination of *Adkisson* in view of *Lee* does not disclose, teach, or

suggest the step of "...etching in **hot phosphoric acid...**" (*emphasis added*) as recited in claim 1. That is, one embodiment of the present invention, as recited in claim 1, uses "hot" phosphoric acid to etch the silicon oxynitride layer.

Applicants believe that *Adkisson* does not disclose, teach, or suggest the concept of using "hot" phosphoric acid to etch the silicon oxynitride layer. It appears from the specification of *Adkisson* that the etchant disclosed is merely phosphoric acid. Thus, Applicants respectfully assert that the combination of *Adkisson* in view of *Lee* does not teach, suggest or disclose the claim limitation of "hot phosphoric acid" as recited in claim 14.

8. Allowability of Newly Added Claims 18-25

a. Claim 18

Applicant respectfully submits that independent claim 18 is allowable for at least the reason that neither *Fu* nor *Adkisson* disclose, teach, or suggest the feature of "removing the antireflective coating **without applying an oxide between the formation of the anti-reflective coating and the removal of the anti-reflective coating,**" as recited in claim 18. That is, one embodiment, among others, of the present invention, as recited in claim 18, requires that the user not apply an oxide between forming the ARC and removing the ARC.

Fu teaches that an oxide must be formed on the edges of the stack prior to removal of the ARC layer. Applicant respectfully submits that *Fu* is in direct conflict with the limitation outlined above. *Adkisson* suggests that "it may be desirable to oxidize the top surface of the silicon oxynitride layer." Thus *Adkisson* actually teaches away from at least one embodiment of the present invention. For these reasons, Applicants respectfully submit that claim 18 is not anticipated or rendered obvious by any combination of *Fu* or *Adkisson* in view of any of the references cited in the Office Action.

b. Claims 19-25

Because independent claim 18 is believed to be allowable over the prior art of record, dependent claims 19-25 (which depend either directly or indirectly from independent claim 18) are allowable as a matter of law for at least the reason that the

dependent claims 19-25 contain all steps of independent claim 18. See, e.g., *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988).

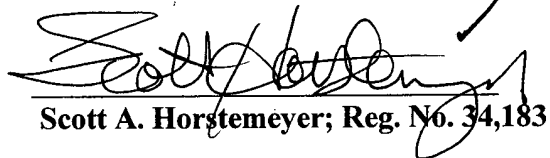
CONCLUSION

In light of the foregoing amendments and for at least the reasons set forth above, Applicants respectfully submit that all objections and/or rejections have been traversed, rendered moot, and/or accommodated, and that the now pending claims 1-10 and 14-25 are in condition for allowance. Favorable reconsideration and allowance of the present application and all pending claims are hereby courteously requested. If, in the opinion of the Examiner, a telephonic conference would expedite the examination of this matter, the Examiner is invited to call the undersigned attorney at (770) 933-9500.

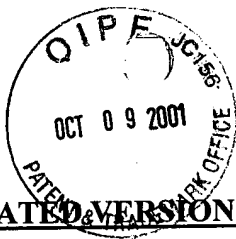
Respectfully submitted,

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**ANNOTATED VERSION OF MODIFIED CLAIMS SHOWING CHANGES
MADE**

Amend the following claims by adding the language that is underlined ("____")
and by deleting the language that is enclosed within brackets ("[]"):

2. (ONCE AMENDED) The process of claim 1 wherein the step of pattern
etching comprises:

forming a patterned structure having an edge and a top; and

forming a layer of insulator on the edge prior to the step of removing the
remaining[anti-reflective coating] layer of silicon oxynitride.

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